

QQQ – Further Statistics 1 – Chapter 8 – Quality of Tests (Version 1)

Total Marks: 22

(22 = Platinum, 20 = Gold, 18 = Silver, 15 = Bronze)

1.

(a) Define

(i) a Type I error,

(ii) a Type II error. **(2)**

Rolls of material, manufactured by a machine, contain defects at a mean rate of 6 per roll.

The machine is modified. A single roll is selected at random and a test is carried out to see whether or not the mean number of defects per roll has decreased. The significance level is chosen to be as close as possible to 5%.

(b) Calculate the probability of a Type I error for this test. **(3)**

(c) Given that the true mean number of defects per roll of material made by the machine is now 4, calculate the probability of a Type II error. **(2)**

(Total 7 marks)

Edexcel S4 June 2014 Q2

2. The number of tornadoes per year to hit a particular town follows a Poisson distribution with mean λ . A weatherman claims that due to climate changes the mean number of tornadoes per year has decreased. He records the number of tornadoes x to hit the town last year.

To test the hypotheses $H_0 : \lambda = 7$ and $H_1 : \lambda < 7$, a critical region of $x \leq 3$ is used.

(a) Find, in terms λ the power function of this test. **(3)**

(b) Find the size of this test. **(2)**

(c) Find the probability of a Type II error when $\lambda = 4$. **(2)**

(Total 7 marks)

Edexcel S4 June 2007 Q5

3. A manufacturer has a machine that produces lollipop sticks.

The length of a lollipop stick produced by the machine is normally distributed with unknown mean μ and standard deviation 0.2

Farhan believes that the machine is not working properly and the mean length of the lollipop sticks has decreased.

He takes a random sample of size n to test, at the 1% level of significance, the hypotheses

$$H_0 : \mu = 15 \quad H_1 : \mu < 15$$

(a) Write down the size of this test. **(1)**

Given that the actual value of μ is 14.9

- (b)** **(i)** calculate the minimum value of n such that the probability of a Type II error is less than 0.05
Show your working clearly. **(6)**
- (ii)** Farhan uses the same sample size, n , but now carries out the test at a 5% level of significance. Without doing any further calculations, state how this would affect the probability of a Type II error. **(1)**

(Total 8 marks)